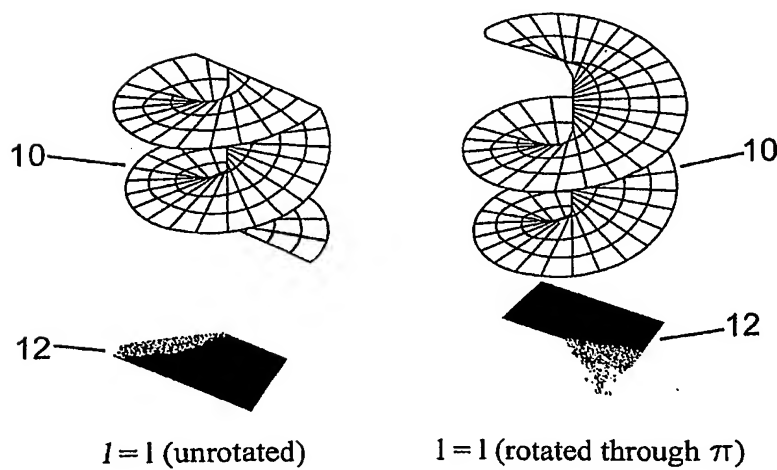
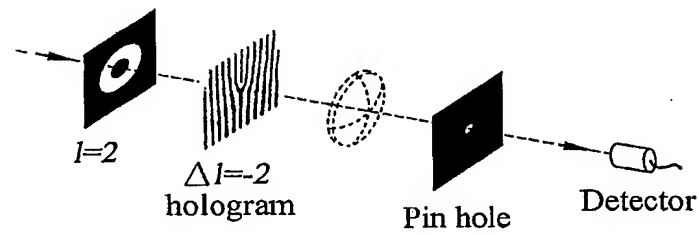
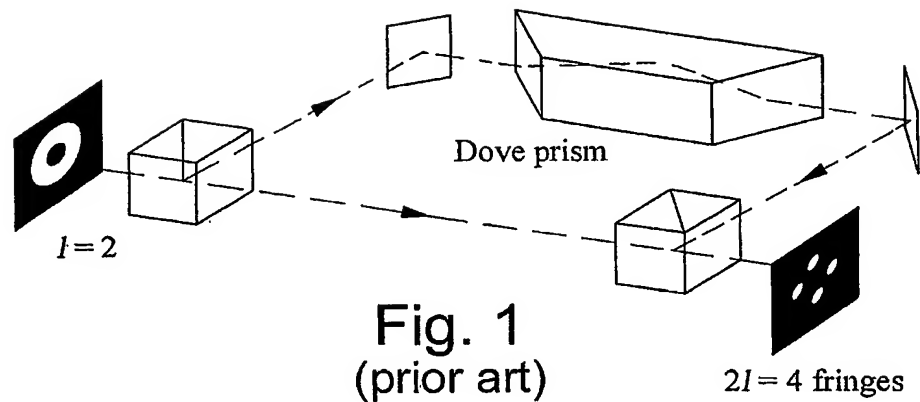


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SUBSTITUTE SHEET (RULE 26)

BEST AVAILABLE COPY

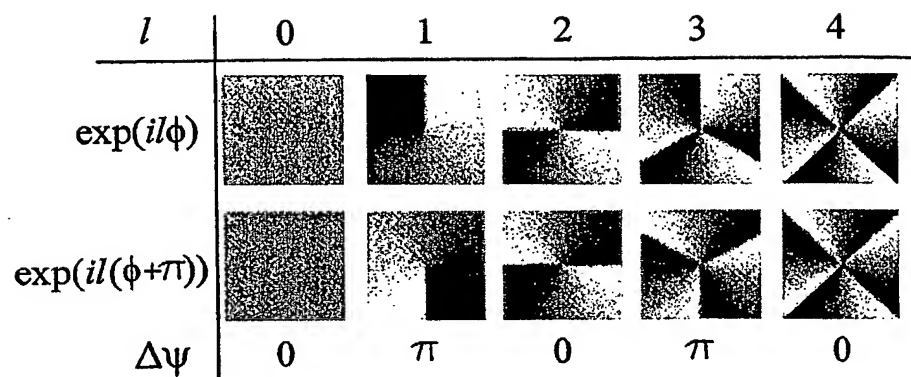


Fig. 4

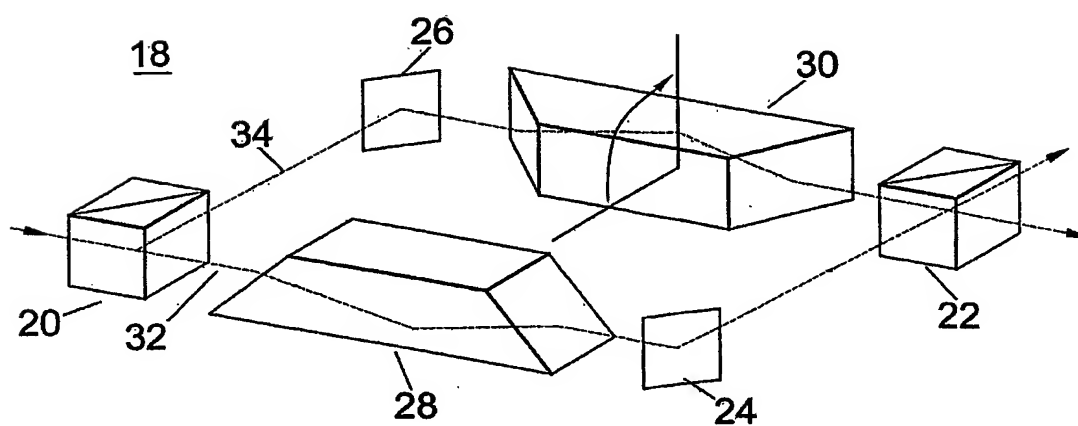


Fig. 5

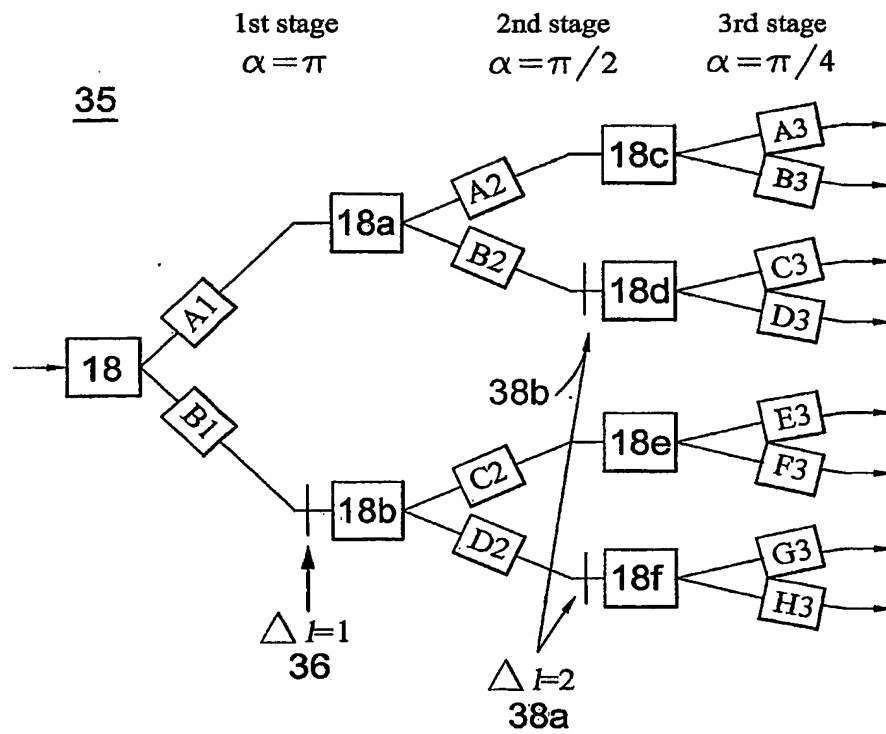


Fig. 6

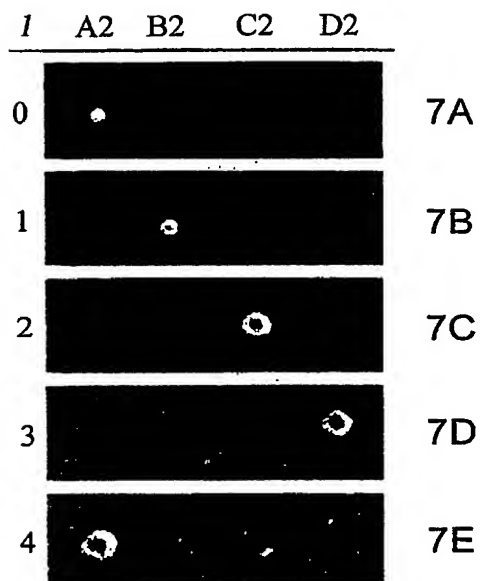


Fig.7

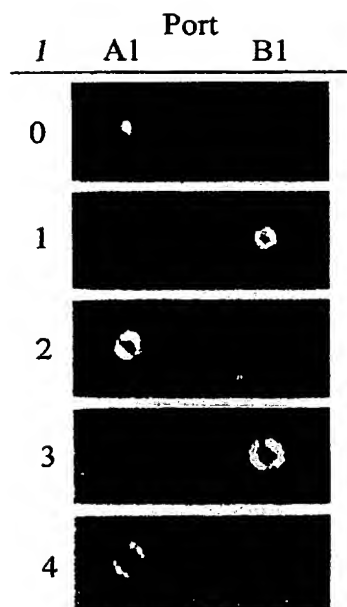


Fig. 8

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Fig. 9

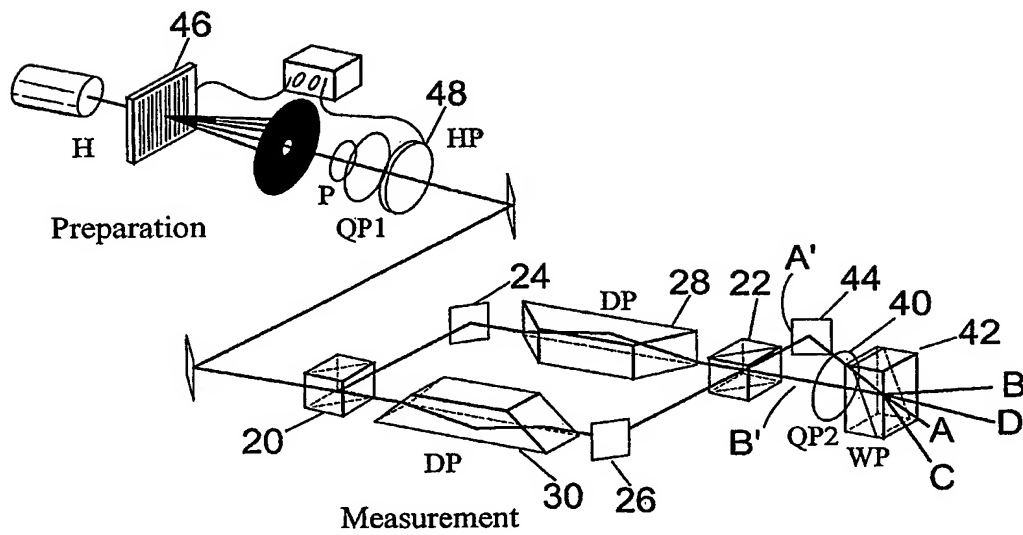


Fig. 10

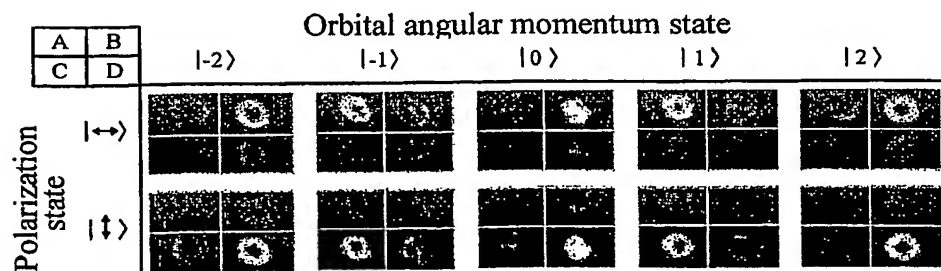
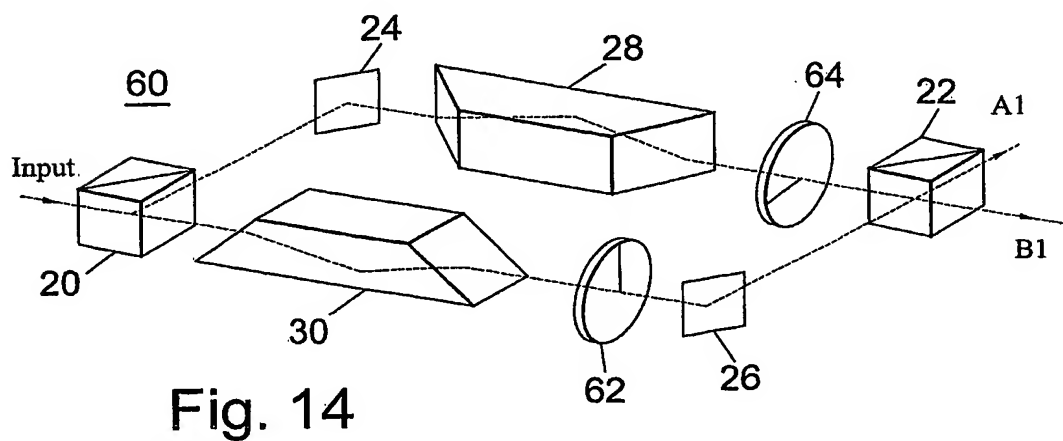
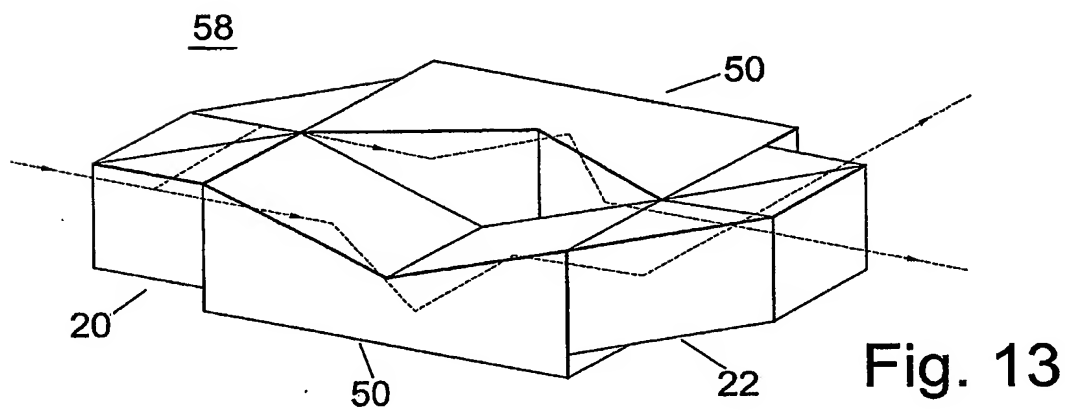
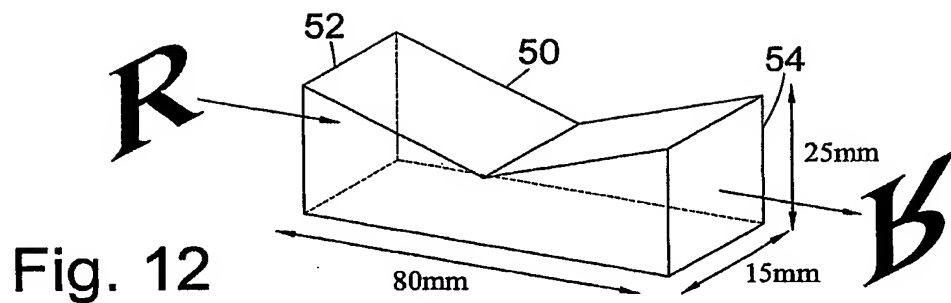


Fig. 11

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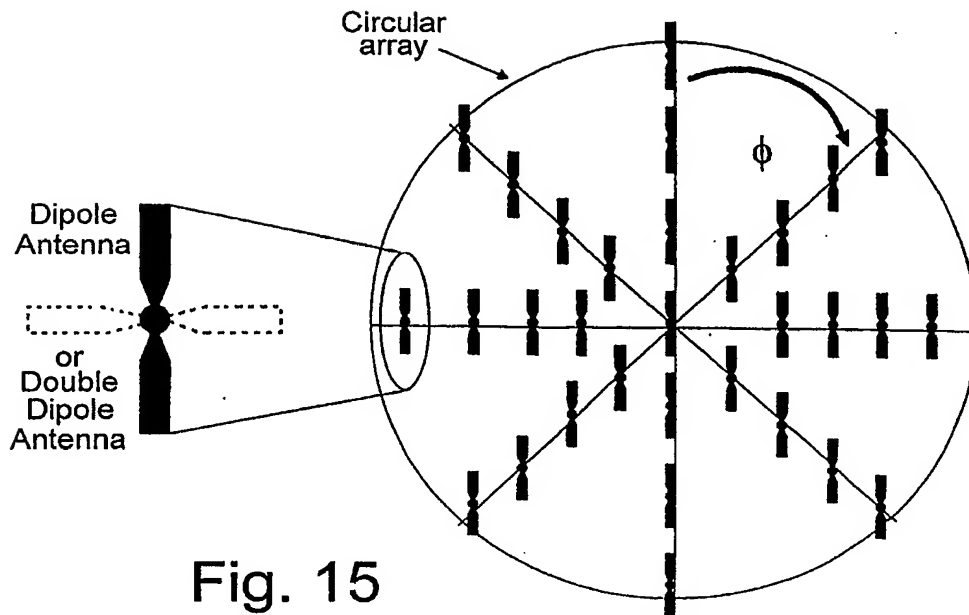


Fig. 15

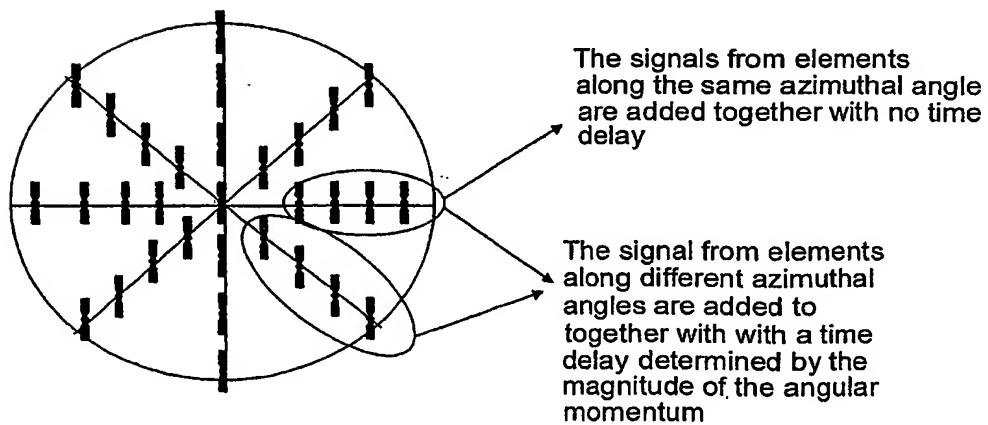
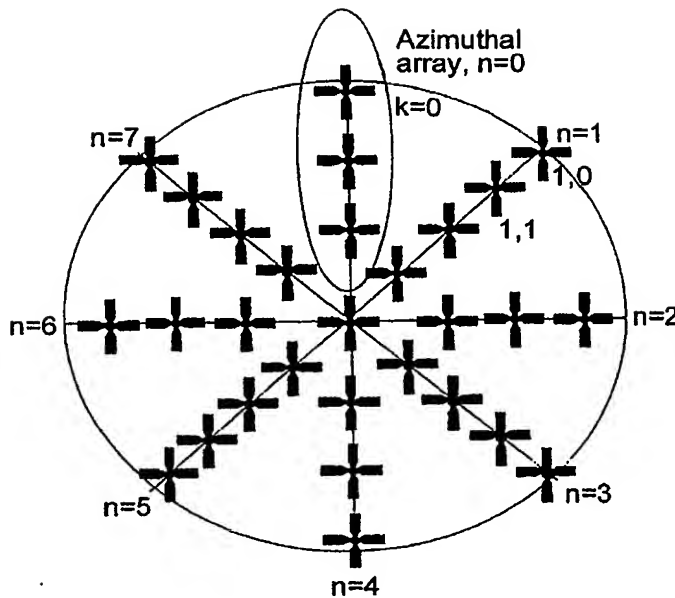


Fig. 16



For the case shown the total number of azimuthal arrays is 8 the angle between arrays  $\pi/4$  radians in general there could be  $m$ , azimuthal arrays and an angle of  $2\pi/m$  between them. Also in general we have a  $k$ th element along each azimuthal array and a total of  $s$ , elements in each azimuthal array.

The elements in each azimuthal array do not have a time delay between them

For each azimuthal array, to generation or detection of a beam of angular momentum,  $l$ , @ frequency,  $\omega$ , requires a time delay (with respect to the  $n=0$  array), given by:-

$$t = \frac{2\pi n l}{m \omega}$$

Followed by summation

Fig. 17

The total array is now described by a,  $m \times r$ , matrix,  $A$ , as follows:-

$$A = \begin{bmatrix} s_{0,0} & \cdot & \cdot & \cdot & s_{0,r} \\ \cdot & & & & \\ \cdot & & & & \\ \cdot & & & & \\ s_{m,0} & \cdot & \cdot & \cdot & s_{m,r} \end{bmatrix}$$

where  $s_{n,k}$  is the signal received at element,  $k$  in the  $n$ th azimuthal array. To detect a received signal with angular momentum,  $l$ , at frequency,  $\omega$  the signal is processed as follows:-

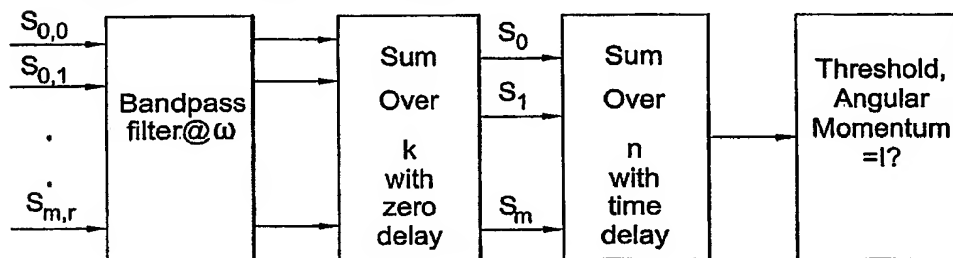
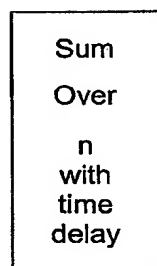


Fig. 18



This part of the signal processing is detailed below

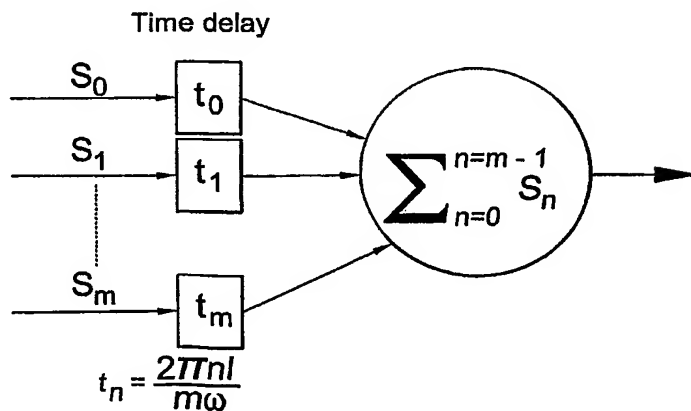


Fig. 19